

Modicon M221 logic controllers

Catalogue
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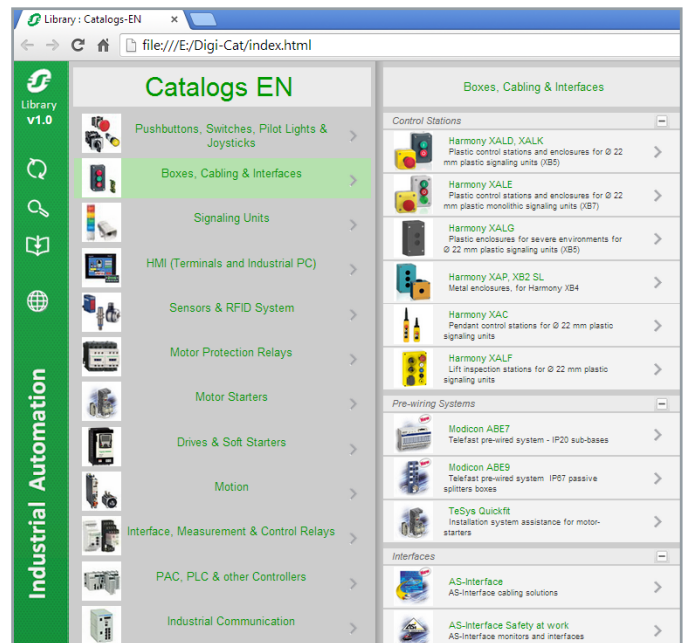
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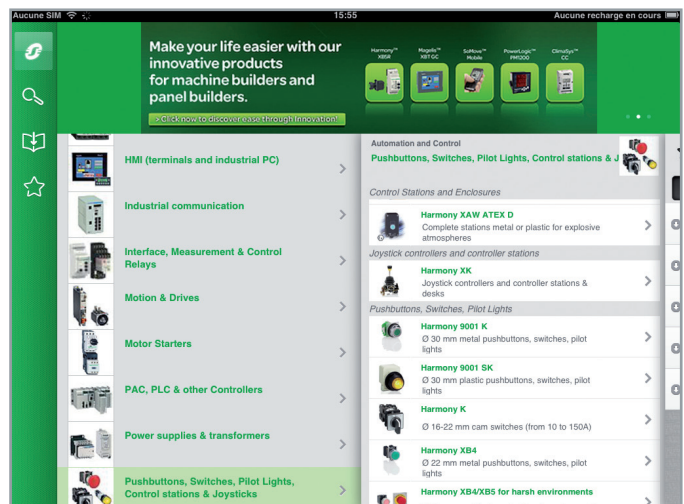
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Modicon™ M221 and Modicon™ M221 Book logic controllers

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Maximize your business and machine performance with MachineStruxure

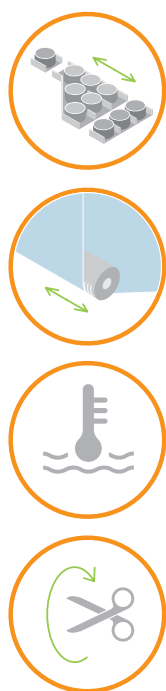


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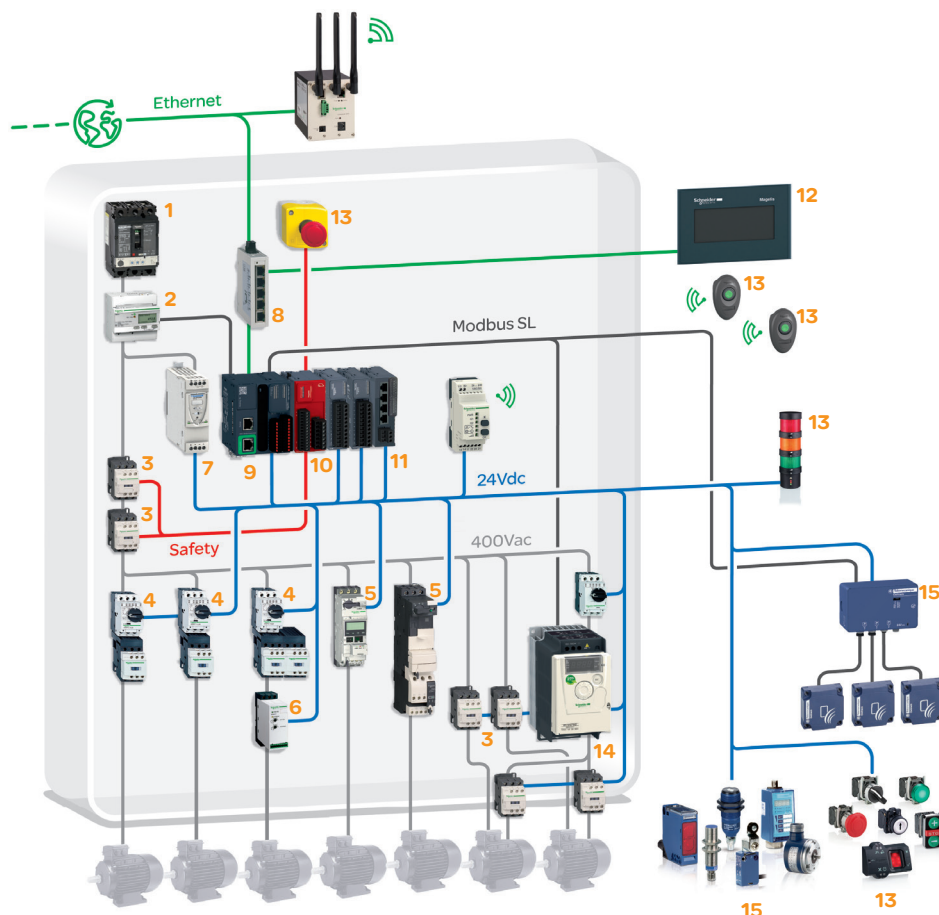
The NEXT generation of MachineStruxure is a complete machine automation solution that provides flexible and scalable machine control, ready-to-use architectures, efficient engineering solutions, and comprehensive customization and engineering support services. It can help you meet your challenges for improved efficiency and greater productivity, as well as allow you to deliver higher added value to your customers throughout the entire machine life cycle.

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Application Function Blocks (AFB)



- | | |
|---|--|
| 1 POWERPACT circuit breaker | 10 Modicon TM3 safety module, Modicon TM3 digital/analog I/O modules |
| 2 Energy meter Acti9 iEM310 iEM310 | 11 Modicon TM3 TeSys motor starter module |
| 3 TeSys D contactor | 12 Magelis display |
| 4 TeSys GV2P motor circuit-breaker | 13 Harmony signalling and control devices |
| 5 TeSys U starter-controller | 14 Altivar 312 variable speed drive |
| 6 Multi9 circuit-breaker C60N | 15 OsiSense: limit switches and inductive sensors |
| 7 Phaseo power supply 24 V $\square$ | |
| 8 Ethernet switch (unmanaged) | |
| 9 Modicon M221 Book logic controller | |

Fastest and smallest logic controllers on the market

Flexible and scalable machine control

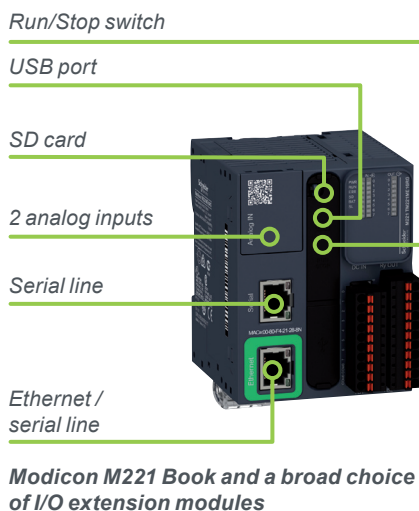
With the new range of Modicon™ logic controllers, the next generation of MachineStruxure provides flexible and scalable machine control. Ethernet connectivity, USB port for programming, and an embedded web server: it's all included.



Modicon M221: the small yet powerful logic controller for hardwired solutions

Everything you need is embedded

The Modicon M221 offers best-in-class performance. Available also in book format, the Modicon M221 requires minimal installation and offers tremendous versatility.



- > SD card, Run/Stop switch, USB port, 2 analog inputs, serial line, Ethernet and serial line, cartridge extension (on standard version): it's all **embedded**.
- > Thanks to its high degree of **flexibility**, it's very easy to add additional modules (safety modules, Tesys motor starter module, extensive line of analog and digital modules, ...) - and still keep everything in **just one configuration**

Modicon M221: the small yet powerful logic controller for hardwired solutions

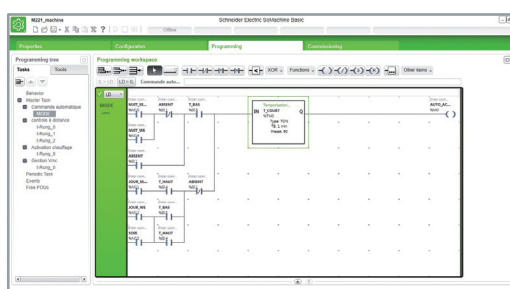


SoMachine simplifies every step in the design and commissioning of your machines

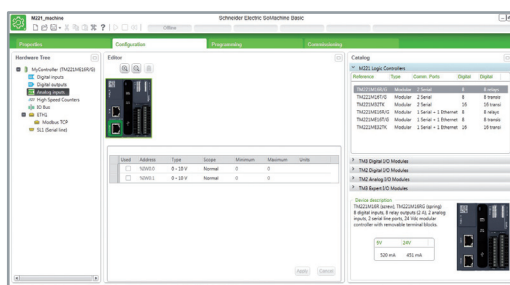
Intuitive machine programming with SoMachine

SoMachine® is the universal programming software for machines automated by MachineStruxure controllers. Simple navigation that requires only fewer clicks delivers a more efficient engineering process.

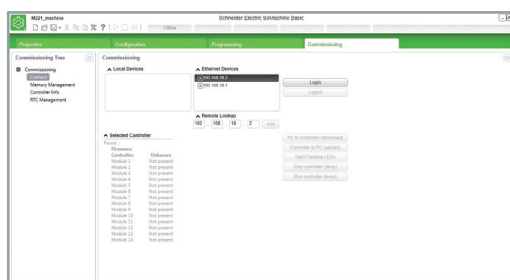
- > In order to reduce complexity we offer SoMachine Basic, a simplified engineering tool for the new controller Modicon M221.
- > All programming, visualization, and commissioning are handled in just one intuitive tool that is available as a free download.
- > No training required



Programming



Configuration



Commissioning



Connected everywhere

For simplified maintenance, commissioning, and uploads/downloads, simply use your smartphone or tablet and connect anytime, anywhere.

- > Application for mobile phone & smartphone
- > Bluetooth® communication



Customization and services

Our experts help you every step of the way, from perfecting machine design to on-site services of the finished machine. Global support, 24/7 hotline services, and replacement parts centers around the world enable you to deliver superior customer support and satisfaction.

Achieve benchmark performance
while increasing profitability



Make the most of your energySM

Applications

Control of simple machines



Supply voltage

100-240 V ~ 24 V ---

100-240 V ~ 24 V ---

100-240 V ~ 24 V ---

Inputs/outputs

■ Logic inputs/outputs

□ No. and type of inputs

□ No. and type of outputs

□ Connection of logic I/O

■ Analog inputs

□ Connection of analog inputs

16 logic I/O

9 sink/source
24 V ---
inputs, inc.
4 high-speed
inputs

7 relay outputs
7 source
transistor
outputs, inc.
2 high-speed
outputs

24 logic I/O

14 sink/source
24 V ---
inputs, inc.
4 high-speed
inputs

10 relay outputs
10 source
transistor
outputs, inc.
2 high-speed
outputs

40 logic I/O

24 sink/source
24 V ---
inputs, inc.
4 high-speed
inputs

16 relay outputs
16 source
transistor
outputs, inc.
2 high-speed
outputs

With removable screw terminal block

2 x 0...10 V analog inputs

On dedicated removable terminal block

I/O extension

Max. number of I/O expansion
modules that can be connected/with
bus expansion modules

- 7 Modicon TM3 expansion modules, along with limited number of outputs, please consult our website www.schneider-electric.com
- 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver), along with limited number of outputs, please consult our website www.schneider-electric.com
- Possible use of Modicon TM2 expansion modules with restrictions.

Embedded communication

Ethernet link

Serial link

1 Ethernet port on TM221CE... controllers:

- Modbus TCP communication (client & server), Modbus TCP slave, Dynamic DHCP client Configuration, Programming, downloading, monitoring
- SMS and emails (▲)

1 serial link port (RJ 45 connector) RS232/485 with + 5 V supply

Functions

Process control

Counting

Position control

PID

Up to 4 high-speed counter inputs (HSC), 100 kHz frequency

- On TM221C...T and TM221CE...T controllers only:
 - pulse width modulation (PWM)
 - pulse generator (PLS)
 - 2 P/D pulse train outputs (PTO) with trapezoidal profile and S curve (▲), 100 kHz frequency

Format

W x H x D

3 controller sizes:

95 x 90 x 70 mm
3.74 x 3.54 x 2.75 in.

110 x 90 x 70 mm
4.33 x 3.54 x 2.75 in.

163 x 90 x 70 mm
6.41 x 3.54 x 2.75 in.

Options

■ Cartridges

Number of cartridge slots

■ Display unit

- 3 analog I/O expansion cartridges
- 1 additional serial link communication cartridge
- 3 application cartridges
 - for control of hoisting applications
 - for control of packaging applications
 - for control of conveying applications

1

1

2

Graphic display and monitoring unit (▲)

Mounting on 15 mm symmetrical rail or panel with specific mounting kit TMAM2

Mounting

Software programming

With SoMachine Basic software, please consult our website www.schneider-electric.com

Logic controller type

Controllers without Ethernet port

Controllers with embedded
Ethernet port

Modicon M221

TM221C16R

TM221C16T

TM221C24R

TM221C24T

TM221C40R

TM221C40T

TM221CE16R

TM221CE16T

TM221CE24R

TM221CE24T

TM221CE40R

TM221CE40T

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▲ Available: 4th quarter 2014.


More technical information on www.schneider-electric.com

Control of simple machines



24 V ---	24 V ---	24 V ---
16 logic I/O	16 logic I/O	32 logic I/O
8 sink/source 24 V --- inputs, inc. 4 high-speed inputs	8 sink/source 24 V --- inputs, inc. 4 high-speed inputs	16 sink/source 24 V --- inputs, inc. 4 high-speed inputs
8 relay outputs	8 source transistor outputs, inc. 2 high-speed outputs	16 source transistor outputs, inc. 2 high-speed outputs
With removable screw terminal block or spring terminal block (1)		To HE 10 connector (with the Modicon Telefast ABE7 pre-wired system: connection cables and sub-bases)
2 x 0...10 V analog inputs		
On dedicated removable terminal block		

- 7 Modicon TM3 expansion modules, along with limited number of outputs, please consult our website www.schneider-electric.com
- 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver), along with limited number of outputs, please consult our website www.schneider-electric.com
- Possible use of Modicon TM2 expansion modules with restrictions.

1 Ethernet port on TM221ME●●● controllers:

- Modbus TCP (client & server), Modbus TCP slave, dynamic DHCP client Configuration, Programming, downloading, monitoring
- SMS and emails (▲)

1 serial link port (RJ 45 connector) RS232/485 with + 5 V supply

1 additional serial link port on TM221M●●● controllers (RJ 45 connector) RS485

PID

Up to 4 high-speed counter inputs (HSC), 100 kHz frequency

- On TM221M16T/TG, TM221ME16T/TG, TM221M32TK and TM221ME32TK controllers only:
 - pulse width modulation (PWM)
 - pulse generator (PLS)
 - 2 P/D pulse train outputs (PTO) with trapezoidal profile and S curve (▲), 100 kHz frequency

1 size only:

70 x 90 x 70 mm

2.75 x 3.543 x 2.75 in.

—

—

Graphic display and monitoring unit (▲)

Mounting on ┘ symmetrical rail or panel with specific mounting kit TMAM2

With SoMachine Basic software, please consult our website www.schneider-electric.com

Modicon M221 Book

TM221M16R	TM221M16T	TM221M32TK
TM221M16RG (1)	TM221M16TG (1)	
TM221ME16R	TM221ME16T	TM221ME32TK
TM221ME16RG (1)	TM221ME16TG (1)	

17

(1) Spring terminal block on references ending in the letter G.

▲ Available: 4th quarter 2014.



More technical information on www.schneider-electric.com

Compatibility of offers

Modicon M221 and M221 Book logic controllers

- > Modicon TM3 expansion modules
- > Modicon TM2 expansion modules
- > SoMachine Basic software



Modicon M221 logic controllers (standart format)
16 I/O channels 24 I/O channels



40 I/O channels



Modicon M221 Book logic controllers
16 I/O channels 32 I/O channels

Presentation

Applications

Designed for simple machines, the particularly small dimensions of Modicon **M221** and **M221 Book** logic controllers are ideal for optimizing the size of wall-mounted and floor standing control system enclosures.

- The controllers are available in 2 formats:
 - Modicon **M221** (TM221C●●●● references), give excellent connection capacity and customization options using I/O, communication or application cartridges without increasing the controller size.
 - Modicon **M221 Book** (TM221M●●● references), combine very small dimensions with a wide choice of connections.
- M221 and M221 Book controllers have an embedded Ethernet port meaning they can easily be integrated in control system architectures, for remote control and maintenance of machines by means of applications for smartphones, tablets and PCs.
- The wealth of functions embedded in M221 and M221 Book controllers minimizes the cost of the machine:
 - Functions embedded in the controller: Modbus serial link, USB port dedicated to programming and simple position control functions (high-speed counters and pulse train outputs with trapezoidal profile and S curve).
 - Functions embedded in the Modicon TM3 expansion: functional safety modules, motor-starter control module, dedicated display unit and remote expansion system.
- SoMachine Basic's programming software is intuitive, making it quick to create applications, and also has embedded configuration of the display unit and extensions, including the Functional Safety modules. This software environment makes it easy to retrieve Twido range applications, maximizing use of the investment already made. Applications can thus easily be ported to any of the Modicon logic controllers: M241, M251 and M258.

Key features

Modicon TM221C●●●	Modicon TM221M●●●
w x h x d	
□ 16 I/O: 95 x 90 x 70 mm (3.74 x 3.54 x 2.75 in.)	□ 16 I/O: 70 x 90 x 70 mm (2.75 x 3.54 x 2.75 in.)
□ 24 I/O: 110 x 90 x 70 mm (4.33 x 3.54 x 2.75 in.)	□ 32 I/O: 70 x 90 x 70 mm (2.75 x 3.54 x 2.75 in.)
□ 40 I/O: 163 x 90 x 70 mm (6.41 x 3.54 x 2.75 in.)	
Supply voltage	
24V $\overline{\text{---}}$ or 100..240 V $\sim$ 50/60 Hz	24 V $\overline{\text{---}}$
Connection of the embedded I/O	
On removable screw terminal blocks at intervals of 5.08 mm ; 24V/0,25A supply provided by the controller to the sensor inputs on TM221C●●●R models	16 I/O: on removable spring or screw terminal blocks at intervals of 3.81 mm/ 0.15 in. 32 I/O: on HE10 connectors with HE 10 cables/bare wires or Telefast ABE7 connection sub-bases (1)
Analog inputs	
2 embedded inputs on each TM221M●●● and TM221C●●● controller	
2 to 4 optional analog inputs with TMC2●● cartridges	—
Embedded Ethernet communication	
Yes on TM221CE●●	Yes on TM221ME●●
Serial link	
1 embedded	1 to 2 embedded
1 optional serial link with TMC2SL1 communication cartridge	—
Cartridges	
One slot for 1 or 2 cartridges depending on the model of controller: analog I/O cartridge, communication cartridge or application cartridges (hoisting, conveying and packaging)	—

Hardware characteristics

M221 and M221 Book controllers each have an embedded:

- Run/Stop switch
- slot for SD memory card
- QR code for direct access to its technical documentation

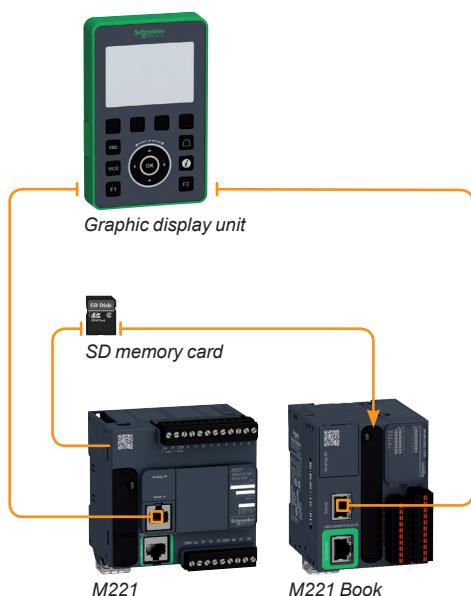
(1) Telefast Modicon ABE7 pre-wired system: to be ordered separately, see page 14.



QRcode example :
QRcode for access to the technical data sheet for TM221M16R logic controller



SoMachine Basic software



Presentation

Embedded communication

M221 and M221 Book logic controllers have 3 types of integrated communication port:

- ☐ Ethernet
- ☐ RS 232/RS 485 serial link
- ☐ programming port

These communication ports are described on page 12.

Embedded functions

Each Modicon M221 and Book logic controller has the following integrated functions:

- ☐ Analog (PID control)
- ☐ Counting: up to 4 high-speed counters (HSC), 100 kHz frequency

TM221C●●T, TM221CE●●T, TM221M16T●, TM221ME16T●, TM221M32TK and TM221ME32TK controllers integrate the position control function with:

- ☐ Pulse width modulation (PWM)
- ☐ Pulse generator (PLS)
- ☐ 2 P/D pulse train outputs (PTO) with trapezoidal profile and S curve, 100 kHz frequency (▲)

Processing power

- ☐ Execution speed: 0.2 μs/boolean instruction
- ☐ Program: 10 K boolean instructions
- ☐ Number of words: 8000
- ☐ Number of internal bits: 512

Programming

M221 and M221 Book logic controllers are programmed with the SoMachine Basic software. Please consult our website www.schneider-electric.com.

SoMachine Basic is an integral component of the SoMachine software.

SoMachine Basic is available on DVD and also as a free download from site www.schneider-electric.com.

Options for Modicon M221 and M221 Book controllers

Graphic display unit ▲

The **TMH2GDB** display unit is a compact display unit dedicated to M221 and M221 Book logic controllers offering diagnostic, maintenance and runtime functions.

- ☐ The display unit can be connected to the SL1 serial link of M221 and M221 Book controllers. This port also provides the power needed by the display unit.
- ☐ A single hole with diameter 22 mm (0.866 in.) allows it to be mounted on the front of the enclosure.
- ☐ The display application is resident in the controller, it is not necessary to load the program in the **TMH2GDB**.

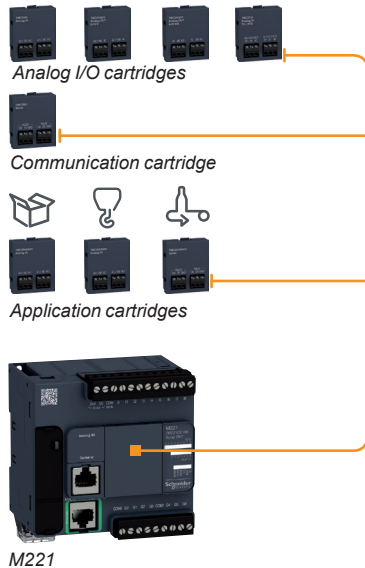
Memory card

The **TMASD1** SD memory card, with 256 MB capacity, is available for:

- ☐ backup and transfer application
- ☐ firmware loading
- ☐ duplication of application between controllers

▲ Availability of functions with trapezoidal profile and S curve: 4th quarter 2014.

▲ Available: 4th quarter 2014.



Option for Modicon TM221C●●● controllers

Cartridges for M221 controller

One or two cartridges can be inserted on the front of TM221C●●● controllers without increasing the dimensions.

3 types of cartridge are offered:

- Analog I/O cartridges
 - **TMC2AI2** for 2 analog inputs which can be configured as voltage or current
 - **TMC2AQ2V** for 2 voltage analog outputs
 - **TMC2AQ2C** for 2 current analog outputs
 - **TMC2TI2** for 2 temperature inputs
- Communication cartridge
 - **TMC2SL1** cartridge providing additional serial link port terminals for connection of a printer, barcode reader, etc.
- Application cartridges
 - **TMC2HOIS01** for hoisting applications has two dedicated analog inputs for controlling a load cell.
 - **TMC2PACK01** for packaging applications has two dedicated analog inputs for controlling the temperature on a packaging machine.
 - **TMC2CONV01** for conveyor system applications has a serial link.

Using an application cartridge provides direct access to application examples via the SoMachineBasic software.



Communication option for Bluetooth® wireless connection

The Bluetooth® wireless connection enables complete freedom of movement within a radius of 10 m/32.808 ft. around the controller.

For its M221 and M221 Book controllers Schneider Electric offers the

TCSWAAC13FB Bluetooth® adapter to perform the following functions:

- commissioning
- monitoring
- downloading

Modicon M221 logic controllers

Modicon M221 and M221 Book logic controllers

I/O extensions with Modicon TM3 expansion modules

I/O extensions with Modicon TM3 expansion modules

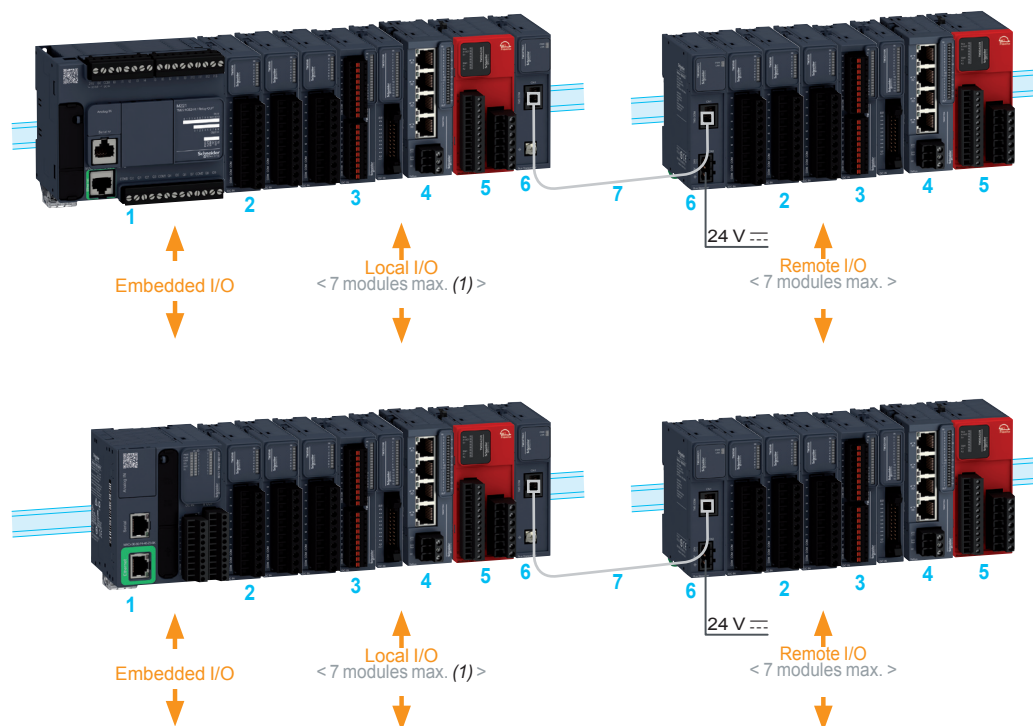
Modicon TM3 expansion modules

The capacity of M221 and M221 Book logic controllers can be enhanced with the Modicon TM3 expansion module offer:

- Digital I/O modules which can be used to create configurations with up to 264 digital I/O. These modules are available with the same connections as the controllers.
- Analog I/O modules which can be used to create configurations with up to 114 analog I/O and are designed to receive, amongst other things, position, temperature, and speed sensor signals. They are also capable of controlling variable speed drives or any other device equipped with a current or voltage input.
- Expert module for control of TeSys motor-starters, connected with RJ 45 cables to simplify wiring up the control section.
- Functional Safety modules that simplify wiring and can be configured in the SoMachine Basic software.

In addition, the TM3 expansion system is flexible due to the possibility of remotely locating some of the TM3 modules in the enclosure or another cabinet, up to 5 meters/16.404 ft. away, using a bus expansion system.

The Modicon TM3 expansion system is common to the whole range of Modicon M221, M241 and M251 logic controllers, meaning that the model of controller can be revised without changing expansion module.



- 1 Modicon M221/M221 Book logic controller
- 2 Modicon TM3 digital I/O modules
- 3 Modicon TM3 analog I/O modules (2)
- 4 Modicon TM3 expert module: control of TeSys motor-starters
- 5 Modicon TM3 functional safety modules
- 6 Modicon TM3 bus expansion module (transmitter and receiver)
- 7 TM3 bus expansion cable

(1) Depending on type of TM3 module used, please consult our website www.schneider-electric.com

(2) Compatibility of expansion module offers: the majority of Modicon TM2 expansion modules can be used with M221 and M221 Book logic controllers. However, adding a Modicon TM2 expansion module in a configuration can increase expansion module execution times by a few milliseconds. The compatibility between Modicon TM2 expansion modules and each M221 or M221 Book logic controller is specified on page 28.

Modicon M221 logic controllers

Modicon M221 and M221 Book logic controllers

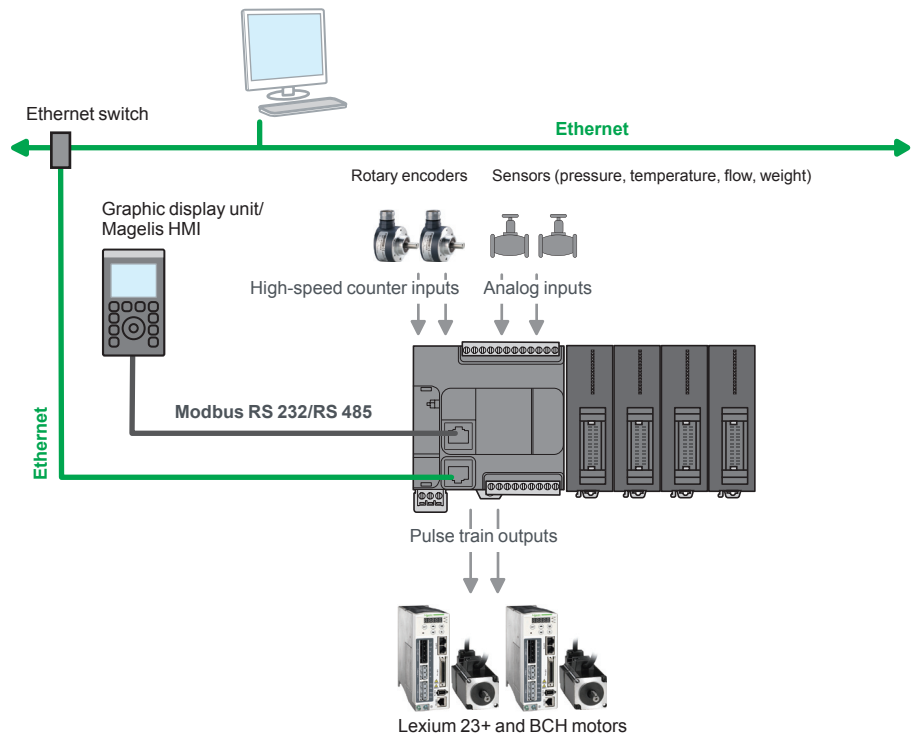
Control architecture

Control architecture for standalone machines

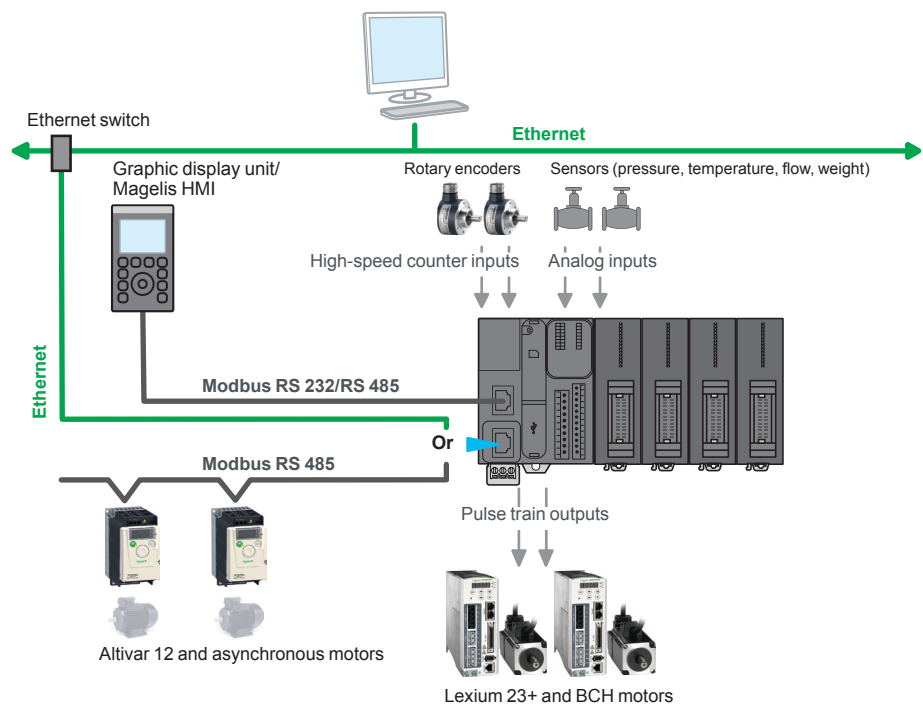
Typical applications: repetitive machines

- Packaging: recycling machines.
- Textile-clothing machines.
- Commercial equipment: automatic wash units, advertising hoardings, etc.
- Construction/service sector: access and entry control for automated systems.
- Other sectors: woodworking, agriculture, fish farming, incubators, swimming pools, etc.

■ M221 (TM221C●●●●) controllers



■ M221 Book (TM221M●●●●) controllers



Modicon M221 logic controllers

Modicon M221 and M221 Book logic controllers

Embedded communication

Characteristics

Embedded communication

Communication on Ethernet network

TM221CE●●● and TM221ME●●● controllers have an embedded RJ 45 Ethernet port (10/100 Mbps, MDI/MDIX) with Modbus TCP (Client/Server), Ethernet IP (adapter), UDP, TCP, SMS (▲) and email (▲) protocols.

- As well as the default address based on the MAC address, a controller IP address can be assigned via a DHCP server or via a BOOTP server.
- The Ethernet port also offers the uploading, updating and debugging functions of the application when the controller is supplied with power.
- The integrity of applications is maintained by cybersecurity functions.
- A firewall allows to lock each communication protocol.

Connection cables and accessories for Ethernet network (see page 22).

Serial links

- Each TM221C●●● controller has an embedded serial link that can be configured as RS 232 or RS 485. A 5 V/200 mA power supply is available on the RJ 45 connector, for using the **TMH2GDB** display unit, a Magelis **XBTN** or **XBTRT** HM, the Bluetooth® **TCSWAAC13FB** communication adapter.
- Each TM221M●●● (Book) controller has one or two embedded serial links.
- The SL1 serial link, found on each M221 Book controller, can be configured as RS 232 or RS 485. In addition, a 5 V/200 mA power supply is available on the RJ 45 connector which then supplies the **TMH2GDB** display unit, a Magelis **XBTN** or **XBTRT** HMI, the Bluetooth® **TCSWAAC13FB** communication adapter or other devices.
- The SL2 serial link, found on TM221M●●● controllers only, is configured as RS 485.

Serial links also provide the functionality for loading, updating and development when the controller is powered.

Embedded in both links the two main protocols used in the market

- Modbus ASCII/RTU Master or Slave
- Character string (ASCII)

Connection cables and accessories for serial link (see page 20).

Software programming with power off charging function

The programming port, equipped with a USB mini-B connector, is embedded in each M221 and M221 Book controller; it is dedicated to communication with a PC equipped with SoMachine Basic for programming, debugging, and maintenance. In addition, it offers the ability to upload an application program or update the firmware without the controller being powered by another source.

Characteristics of M221 and M221 Book logic controllers

Conformity

■ Certifications

- CE, cULus Listing Mark, C-Tick, EAC, LR, ABS, DNV and GL (1)

■ Standards

- IEC/EN 61131-2 (Edition 2 2007), UL 508 (UL 61010-2-201), ANSI/ISA 12.12.01-2007, CSA C22.2 No. 213, No. 142, E61131-2 and I ACS E10

Environment characteristics

- Ambient operating temperature: - 10...+ 55 °C (14...+ 131 °F).
- Storage temperature: - 25...+ 70°C (- 13...+ 158°F)
- Relative humidity: 10...95 % (non-condensing)
- Operating altitude: 0...2,000 m (0...6,561 ft)
- Storage altitude: 0...3,000 m (0...9,842 ft)
- Immunity to mechanical stress (vibrations):
 - For 1131: 5...8.4 Hz (amplitude 3.5 mm/0.138 in.); 8.4...150 Hz (acceleration 1 g)
 - For merchant marine: 5...13.2 Hz (amplitude 1.0 mm/0.039 in.); 13.2...100 Hz (acceleration 0.7 g)

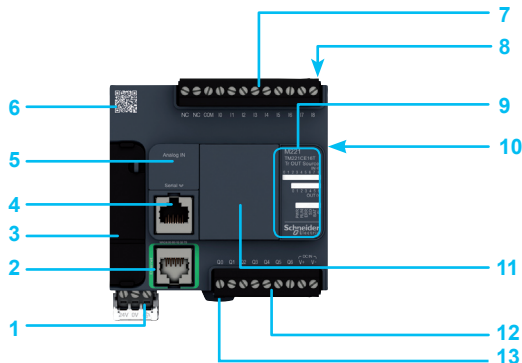
Supply characteristics

Two power supply types are available depending on M221 controller model: 24 V ~ or 100-240 V ~

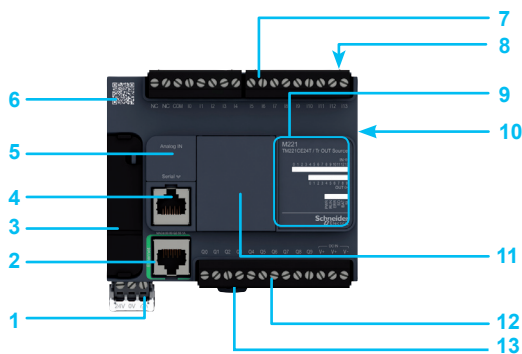
- Voltage limit (ripple included): 19.2...28.8 V ~ /85...264 V ~
- Immunity to micro-cuts (class PS-2): 10 ms
- Max. consumption: 17.2 W

(1) LR, ABS, DNV and GL marine certifications: pending.

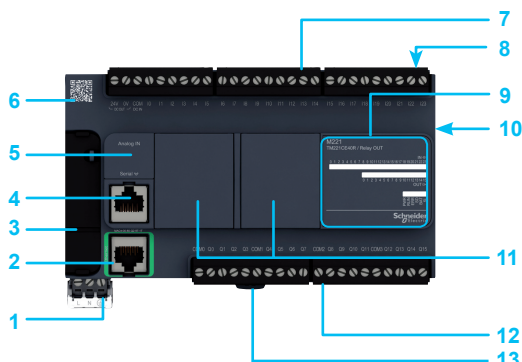
▲ Available: 4th quarter 2014.



M221: 16 I/O



M221: 24 I/O



M221: 40 I/O



TMH2GDB

Description

M221 (TM221C●●●) logic controllers

- 1 Removable screw terminal block, 3 terminals for connecting the 24 V $\overline{\text{DC}}$ or the 100-240 V $\sim$ power supply (depending on model)
- 2 On TM221CE●●● controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.
- 3 Behind the removable cover:
 - USB mini-B connector for connecting a PC equipped with the SoMachine Basic software
 - Slot for the SD memory card
 - Run/Stop switch
- 4 Serial link port (RS 232 or RS 485): RJ 45 connector.
- 5 Behind a cover: dedicated removable connector for two analog inputs.
- 6 Controller technical documentation QR code.
- 7 Connection of 24 V $\overline{\text{DC}}$ logic inputs on removable screw terminal blocks (1).
- 8 On top of the controller: slot for backup battery.
- 9 LED display block showing:
 - the status of the controller and its components (battery, SD memory card)
 - the status of the serial link
 - the status of the I/O
- 10 On the side of the controller: TM3 bus connector for the link with a Modicon TM3 expansion module.
- 11 Slot(s) for I/O cartridge(s), communication cartridge or application cartridge(s): one on M221 controllers with 16 and 24 I/O, two on M221 controllers with 40 I/O.
- 12 Connection of relay/transistor logic outputs: on removable screw terminal blocks (1).
- 13 Clip for locking on $\sqcap$ symmetrical rail.

(1) Removable screw terminal blocks equipped with screw terminals, supplied with M221 logic controller.

Graphic display unit TMH2GDB ▲

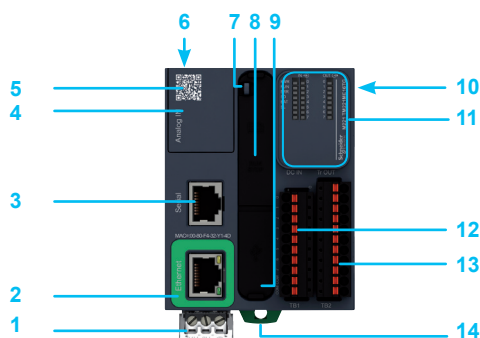
- 1 Control screen:
 - backlit STN graphic screen, two-tone (white/red), 240 x 160 pixels
 - graphic objects: bar charts, buttons, lights, graphic symbols
 - languages available: main international alphabets available in two sizes: 5 x 7 pixels and 11 x 15 pixels
 - 2 Ten command buttons, two of which can be customized with the option of identifying associated functions.
 - 3 Rotary navigation and control wheel.
- On the back of the display unit:
- 4 Mounting system consisting of: locking nut, seal and anti-rotation tee.
 - 5 RJ 45 connector for the cable linking the graphic display to the controller.

Characteristics of the graphic display unit

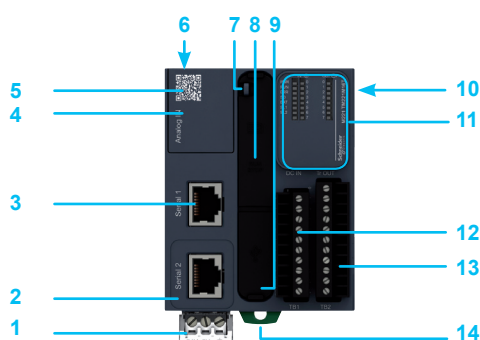
The graphic display unit conforms to CE, UL and CSA standards.

- Ambient operating temperature: - 10...+ 55°C (+ 14...+ 131°F).
- Degree of protection: IP 65.
- Power supply: 5 V $\overline{\text{DC}}$ (200 mA) directly by the controller.
- Power consumption: 1 W.
- Dimensions (w x h x d): 80 x 126 x 19.2 mm/3.15 x 4.96 x 0.75 in.
- Mounting: the display unit is mounted on a cabinet door in a hole $\varnothing$ 22 mm (0.866 in.), fixed onto it with a locking nut, in the same way as a pushbutton.

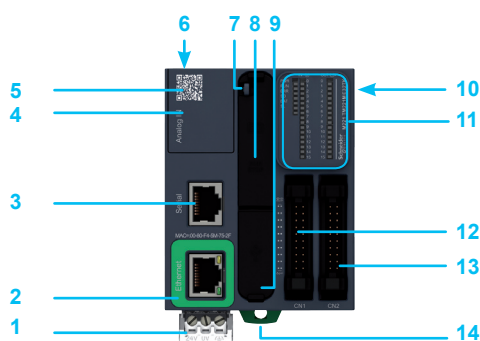
▲ Available: 4th quarter 2014.



TM221ME16TG



TM221M16T



TM221ME32TK



TMH2GDB

Description

M221 Book logic controllers (TM221M●●●)

- 1 Removable screw terminal block, 3 terminals for connecting the 24 V $\overline{\text{---}}$ power supply.
- 2 On TM221ME16●● and TM221ME32●● controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.
On TM221M16●● and TM221M32●● controllers: RJ 45 connector for SL2 serial link.
- 3 SL1 serial link port (RJ 45 connector).
- 4 Behind a cover: dedicated removable connector for two analog inputs.
- 5 Controller technical documentation QR code.
- 6 Backup battery slot.

Behind the removable cover: 7, 8 and 9

- 7 Slot for the SD memory card.
- 8 Run/Stop switch.
- 9 USB mini-B connector, for connecting a PC equipped with the SoMachine Basic software.
- 10 TM3 bus connector for linking to a Modicon TM3 expansion module.
- 11 LED display block showing:
 - the status of the controller and its components (battery, SD memory card)
 - the status of the serial link
 - the status of the I/O
- 12 Connection of 24 V $\overline{\text{---}}$ logic inputs:
 - on 16-channel controllers: removable spring or screw terminal blocks (1)
 - on 32-channel controllers: HE10 connector
- 13 Connection of relay/transistor logic outputs:
 - on 16-channel controllers: removable spring or screw terminal blocks (1)
 - on 32-channel controllers: HE10 connector
- 14 Clip for locking on $\perp$ symmetrical rail.

(1) Removable terminal blocks equipped with screw or spring-type terminals depending on controller type. Terminal blocks supplied with M221 Book controller.

Graphic display unit TMH2GDB ▲

Description and characteristics: see page 14

▲ Available: 4th quarter 2014.



TM221C16R
TM221C16T



TM221CE16R
TM221CE16T



TM221C24R
TM221C24T



TM221CE24R
TM221CE24T



TM221C40R
TM221C40T



TM221CE40R
TM221CE40T



TMC2AI2



TMC2AQ2V



TMC2AQ2C



TMC2TI2



TMC2SL1



TMC2PACK01



TMC2HOIS01



TMC2CONV01

References

Modicon M221 logic controllers (1)

Number of logic I/O	Logic inputs	Logic outputs	Analog inputs	Integrated communication ports (2)		Reference	Weight kg/ lb
				Ethernet (RJ 45)	Serial link (RJ 45)		

■ 100-240 V ~ power supply

16 inputs/outputs	9 sink/source 24 V ~ inputs, inc. 4 high-speed inputs	7 relay outputs	2 x 0...10 V inputs	—	1	TM221C16R	0.346/ 0.763
				1	1	TM221CE16R	0.346/ 0.763
24 inputs/outputs	14 sink/source 24 V ~ inputs, inc. 4 high-speed inputs	10 relay outputs	2 x 0...10 V inputs	—	1	TM221C24R	0.395/ 0.871
				1	1	TM221CE24R	0.395/ 0.871
40 inputs/outputs	24 sink/source 24 V ~ inputs, inc. 4 high-speed inputs	16 relay outputs	2 x 0...10 V inputs	—	1	TM221C40R	0.456/ 1.005
				1	1	TM221CE40R	0.456/ 1.005

■ 24 V ~ power supply

16 inputs/outputs	9 sink/source 24 V ~ inputs, inc. 4 high-speed inputs	7 source transistor outputs, inc. 2 high-speed outputs	2 x 0...10 V inputs	—	1	TM221C16T	0.346/ 0.763
				1	1	TM221CE16T	0.346/ 0.763
24 inputs/outputs	14 sink/source 4 V ~ inputs, inc. 4 high-speed inputs	10 source transistor outputs, inc. 2 high-speed outputs	2 x 0...10 V inputs	—	1	TM221C24T	0.395/ 0.871
				1	1	TM221CE24T	0.395/ 0.871
40 inputs/outputs	24 sink/source 24 V ~ inputs, inc. 4 high-speed inputs	16 source transistor outputs, inc. 2 high-speed outputs	2 x 0...10 V inputs	—	1	TM221C40T	0.456/ 1.005
				1	1	TM221CE40T	0.456/ 1.005

Options for Modicon M221 logic controllers (3)

Description	Function	Reference	Weight kg/ lb
I/O cartridges	2 analog inputs (12-bit resolution) which can be configured as: - 0...10 V voltage - 0...20 mA/4...20 mA current Connection via screw terminal block	TMC2AI2	0.025/ 0.055
	2 analog outputs (12-bit resolution) 0...10 V voltage Connection via screw terminal block	TMC2AQ2V	0.025/ 0.055
	2 analog outputs (12-bit resolution) 4...20 mA current Connection via screw terminal block	TMC2AQ2C	0.025/ 0.055
	2 temperature inputs (12-bit resolution) type K, J, R, S, B, E, T, N, C, PT100, PT1000, NI100, NI1000 Connection via screw terminal block	TMC2TI2	0.025/ 0.055
	1 additional serial link on screw terminal block	TMC2SL1	0.025/ 0.055
Cartridges for specific application	Hoisting application	TMC2HOIS01	0.025/ 0.055
	Packaging application	TMC2PACK01	0.025/ 0.055
	Conveyor system application	TMC2CONV01	0.025/ 0.055

- (1) M221 controllers are supplied with:
- removable screw terminal blocks for connecting the I/O
 - a removable screw terminal block for connecting the power supply
 - a button cell backup battery (BR2032)
 - a cable for connecting the analog inputs

- (2) Each M221 logic controller has an embedded USB mini-B programming port.

- (3) One cartridge for controllers with 16 and 24 I/O. Two cartridges maximum for controllers with 40 I/O, only one of which can be a communication cartridge.



TM221M16RG



TM221M16T



TM221ME16RG



TM221ME16T



TM221M16TG



TM221M32TK



TM221ME32TK

References

Modicon M221 Book logic controllers (1)

24 V $\square$ power supply

No. of logic I/O	Logic inputs	Logic outputs	Analog inputs	Embedded communication ports (2)	Serial link		Term. block for I/O conn. Interval (mm/in.)	Reference	Weight kg/lb
					Ethernet (RJ 45)	SL1 (RJ 45)	SL2 (RJ 45)		
16 inputs/outputs	8 sink/source 24 V $\square$ inputs, inc. 4 high-speed inputs	8 relay outputs	2 x 0...10 V inputs	–	1	1	screw (3.81/0.15)	TM221M16R	0.264/0.582
				–	1	1	spring (3.81/0.15)	TM221M16RG	0.264/0.582
				1	1	–	screw (3.81/0.15)	TM221ME16R	0.264/0.582
				1	1	–	spring (3.81/0.15)	TM221ME16RG	0.264/0.582
		8 source transistor outputs, inc. 2 high-speed outputs	2 x 0...10 V inputs	–	1	1	screw (3.81/0.15)	TM221M16T	0.264/0.582
				–	1	1	spring (3.81/0.15)	TM221M16TG	0.264/0.582
				1	1	–	screw (3.81/0.15)	TM221ME16T	0.264/0.582
				1	1	–	spring (3.81/0.15)	TM221ME16TG	0.264/0.582
32 inputs/outputs	16 sink/source 24 V $\square$ inputs, inc. 4 high-speed inputs	16 source transistor outputs, inc. 2 high-speed outputs	2 x 0...10 V inputs	–	1	1	HE 10 connector	TM221M32TK	0.270/0.595
				1	1	–	HE 10 connector	TM221ME32TK	0.270/0.595

(1) M221 Book controllers are supplied with:

- removable terminal blocks (screw or spring-type depending on controller model) for connecting the I/O
- a removable screw terminal block for connecting the power supply
- a button cell backup battery (BR2032)
- a cable for connecting the analog inputs

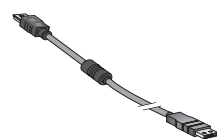
(2) Each M221 Book logic controller has an embedded USB mini-B programming port.



TMH2GDB



TMASD1



TCSXCNAMUM3P

References

Common options for Modicon M221 and M221 Book logic controllers

Description	Function	Reference	Weight kg/ lb
Graphic display unit	Display and modification of data	TMH2GDB ▲	— —
SD memory card	Application backup and program transfer capacity: 256 MB	TMASD1	0.004/ 0.009

Separate parts for Modicon M221 and M221 Book logic controllers

Description	Details	Reference	Weight kg/ lb
Mounting kit Sold in lots of 10	For plate or panel mounting of M221 and M221 Book controllers	TMAM2	0.065/ 0.143

Replacement parts

Description	Details	Unit reference	Weight kg/ lb
Set of terminal blocks for connecting the power supply on M221 and M221 Book logic controllers	8 removable screw terminal blocks	TMAT2PSET	0.127/ 0.280
Set of terminal blocks for connecting the I/O on M221 controllers	Removable screw terminal connectors: 8 different connectors for equipping a TM221C●●●● logic controller (8 x I/O)	TMAT2CSET	0.127/ 0.280
Set of terminal blocks for connecting the I/O on M221 Book controllers	4 x 10-way and 4 x 11-way removable terminal blocks with screw terminals	TMAT2MSET	0.127/ 0.280
	4 x 10-way and 4 x 11-way removable terminal blocks with spring terminals	TMAT2MSETG	0.127/ 0.280
Backup battery	The battery supplied with each controller is not available as a separate element Schneider reference. If necessary spare parts, use only a Panasonic BR2032 battery type.		

Programming software

Description	For use with	Reference
SoMachine Basic	Modicon M221 and M221 Book logic controllers	Please consult our website www.schneider-electric.com

Expansion modules

Description	For use with	Reference
Modicon TM3 expansion modules	Modicon M221 and M221 Book logic controllers	Please consult our website www.schneider-electric.com

Cordsets

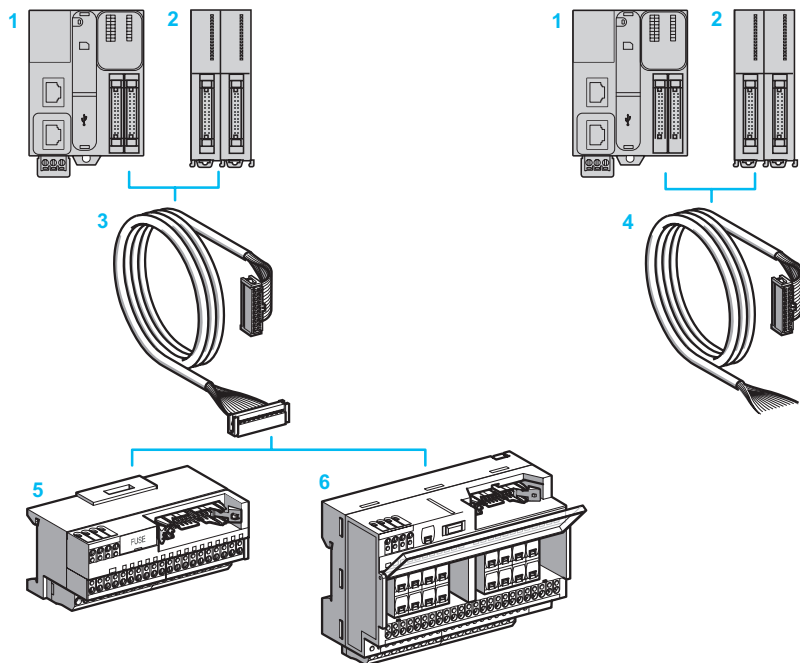
Description	For use	Length m/ ft	Reference	Weight kg/ lb
Programming cables	From the PC USB port to the USB mini-B port on M221 and M221 Book controllers	3/ 0.98	TCSXCNAMUM3P (1)	0.065/ 0.143
		1.8/ 5.90	BMXXCAUSBH018	0.065/ 0.143
Cable for connecting the analog inputs embedded in M221 and M221 Book controllers	Equipped with 1 dedicated removable connector at one end and bare wires at the other end	1/ 3.28	TMACBL1	0.024/ 0.053

(1) Unshielded cable without grounding. To be used only for temporary connections. For permanent connections, use the reference BMXXCAUSBH018 programming cable.

▲ Available: 4th quarter 2014.

Telefast pre-wired system with Modicon ABE 7

For 32-channel Modicon M221 Book logic controller and Modicon TM3 digital I/O expansion modules



Possible combinations:

- (1 or 2) + 3 + (5 or 6)
- (1 or 2) + 4

- 1 32-channel Modicon M221 Book logic controllers (TM221M32TK, TM221ME32TK), equipped with HE 10 connectors.
- 2 Digital I/O modules (TM3D16K, TM3D132K) with 16 or 32 I/O, equipped with HE 10 connectors.
- 3 ABFT20E cordsets with one HE 10 connector at each end.
- 4 TWDFCW cordsets with an HE 10 connector at one end and flying leads at the other end for direct connections to sensors, preactuators and terminal blocks.
- 5 16-channel sub-base for input expansion modules.
- 6 16-channel sub-base for output expansion modules.

Combinations of Modicon ABE7 sub-bases with M221 Book controllers and TM3 expansion modules

		Modicon M221 Book logic controllers	Modicon TM3 I/O expansion modules		
			Digital inputs	Source outputs	Sink outputs
		TM221M32TK TM221ME32TK	TM3DI16K TM3DI32K	TM3DQ16TK TM3DQ32TK	TM3DQ16UK TM3DQ32UK
16-channel sub-bases	Miniature passive	ABE7E16EPN20 (1) ABE7E16SPN20 (2) ABE7E16SPN22 (2)	ABE7E16EPN20	ABE7E16SPN20 ABE7E16SPN22	Use TWDFCW cordsets
	2 A relay	ABE7E16SRM20 (2)	—	ABE7E16SRM20	Use TWDFCW cordsets

(1) Compatible with inputs only.

(2) Compatible with outputs only.

compatible

References



ABE7E16EPN20



ABE7E16SRM20

Sub-bases		Compatibility		LED on each chnnl.	Fuse	Reference	Weight kg/lb
16 inputs	Sink: 24 V $\square$	TM221M32TK/ME32TK, TM3DI16K		No	No	ABE7E16EPN20	0.430/0.948
16 outputs	Source: 24 V $\square$	TM221M32TK/ME32TK, TM3DQ16TK		No	No	ABE7E16SPN20	0.450/0.992
				Yes	Yes	ABE7E16SPN22	0.450/0.992
	Relay: 24 V $\square$ / 250 V $\sim$, 2 A	TM221M32TK/ME32TK, TM3DQ16TK		No	No	ABE7E16SRM20	0.430/0.948
Cordsets							
Description	Compatibility	Cable connection		Gauge/CSA	Length m/ft	Reference	Weight kg/lb
		M221 and TM3	Telefast end				
Cordsets for digital I/O	TM221M32TK, TM221ME32TK, TM3DI16K, TM3DI32K, TM3DQ16TK, TM3DQ32TK	20-way HE 10	20-way HE 10	AWG 28 0.08 mm ²	0.5/1.64	ABFT20E050	0.060/0.132
					1/3.28	ABFT20E100	0.080/0.176
					2/6.56	ABFT20E200	0.140/0.309
					3/9.84	TWDFCW30K	0.405/0.893
					5/16.40	TWDFCW50K	0.670/1.477
	TM221M32TK, TM221ME32TK, TM3DI16K, TM3DI32K, TM3DQ16TK, TM3DQ32TK, TM3DQ16UK, TM3DQ32UK	20-way HE 10	Flying leads	AWG 22 0.035 mm ²			

Presentation

RS 232/RS 485 serial links offer a simple solution to the communication needs of compact machines.

Modbus and ASCII standard communication protocols are used to connect numerous equipment items such as: HMIs, printers, energy meters, variable speed drives, motor starters, remote I/O (RIO), etc.

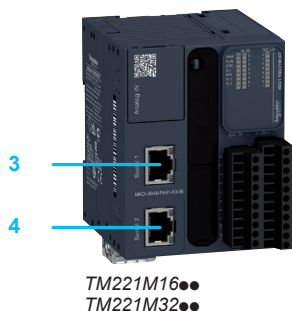
Description

■ Modicon M221 logic controllers with 16, 24 or 40 I/O have the following on the front panel:

- 1 A serial link port with an RJ45 connector delivering a voltage of 5 V (200 mA) to supply an HMI or Bluetooth® adaptor with power.
- 2 A slot for a 2nd serial link port (with connection on screw terminals) by inserting the **TMC2SL1** communication cartridge or the **TMC2CONV01** application cartridge (1).

■ Modicon M221 Book logic controllers with 16 or 32 I/O have the following on the front panel:

- 3 A serial link port with an RJ45 connector delivering a voltage of 5 V (200 mA) to supply an HMI or Bluetooth® adaptor with power.
- 4 A 2nd serial port also equipped with an RJ45 connector for **TM221M16●●** and **TM221M32●●** controllers (controllers without embedded Ethernet).

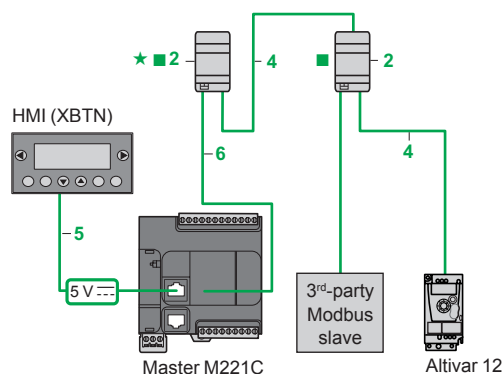


Controller Type	Embedded Ports		Optional Port (1 max. per controller)
	"Serial" or "Serial 1" port, RJ45 connector	"Serial 2" port, RJ45 connector	
TM221C●●●●	RS 232/RS 485 with 5 V (200 mA) power supply for HMI or Bluetooth communication adaptor (items 1/3)	—	On TMC2SL1 or TMC2CONV01 option cartridges, connection on screw terminals RS 232/RS 485 (item 2)
TM221M●●●●	—	RS 485 (item 4)	—
TM221ME●●●●	—	—	—

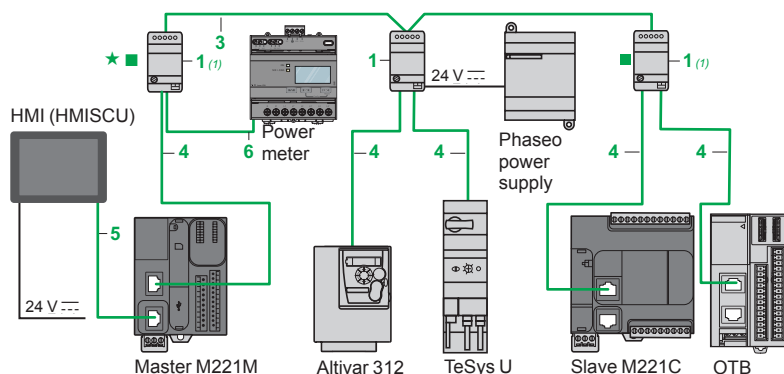
(1) TM221C40●●●● controllers have 2 slots for a cartridge; only one cartridge, TMC2SL1 or TMC2CONV01, can be used per controller. The other slot remains available for an analog I/O cartridge or an application cartridge.

Modbus serial link wiring system

Non-isolated bus



Isolated bus (recommended for bus > 10 m/32.808 ft)



- Total length of cables between M221 and ATV 12: ≤ 30 m (98.425 ft)

- Length of cable 4: ≤ 10 m (32.808 ft)

★ Line polarization active. ■ Line termination

- Total length of cables between isolation boxes 1: ≤ 1000 m (3280.840 ft)

- Length of drop cables 4 or 5: ≤ 10 m (32.808 ft)

★ Line polarization active. ■ Line termination

(1) Box powered by the logic controller.

References



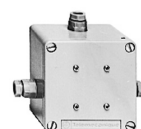
TWDXCAISO



TWDXCAT3RJ



LU9GC3



TSXSCA50



XGSZ24

Tap-off and adaptor components for RS 485 serial link

Designation	Description	Item	Length m/ ft	Unit reference	Weight kg/ lb
T-junction and isolation box Screw terminals for trunk cable 2 x RJ45 for tap-off	☐ Isolation of the RS 485 link (1) ☐ Line termination (RC 120 Ω, 1nF) ☐ Line pre-polarization (2 R 620 Ω) ☐ 24 V $\overline{\text{---}}$ power supply (screw terminals) or 5 V $\overline{\text{---}}$ power supply (via RJ45) ☐ Mounting on 35 mm (1.378 in.) $\perp$	1	—	TWDXCAISO	0.100/ 0.220
T-junction box 1 x RJ45 for trunk cable 2 x RJ45 for tap-off	☐ Line termination (RC 120 Ω, 1nF) ☐ Line pre-polarization (2 R 620 Ω) ☐ Mounting on 35 mm (1.378 in.) $\perp$	2	—	TWDXCAT3RJ	0.080/ 0.176
Modbus splitter box Screw terminals for trunk cable 10 x RJ45 for tap-off	☐ Mounting on 35 mm (1.378 in.) $\perp$, on plate or panel	—	—	LU9GC3	0.500/ 1.102
T-junctions 2 x RJ45 for trunk cable	1 integrated cable with RJ45 connector for tap-off dedicated to Altivar variable speed drive	—	0.3/ 0.98	VW3A8306TF03	—
			1/ 3.28	VW3A8306TF10	—
Passive T-junction box	☐ 1-channel line extension and tap-off on screw terminals ☐ Line termination	—	—	TSXSCA50	0.520/ 1.146
RS 232C/RS 485 line converter	☐ Max. data rate 19.2 Kbps, No modem signals ☐ 24 V $\overline{\text{---}}$ /20 mA power supply ☐ Mounting on 35 mm (1.378 in.) $\perp$	—	—	XGSZ24	0.100/ 0.220

Cables and cordsets for RS 232 serial link

RS 485 double shielded twisted pair trunk cables	Modbus serial link, supplied without connector	3	100/ 328.06	TSXCSA100	5.680/ 12.522
			200/ 656.17	TSXCSA200	10.920/ 24.074
			500/ 1640.42	TSXCSA500	30.000/ 66.139
Modbus RS 485 cordsets	2 x RJ45 connectors	4	0.3/ 0.98	VW3A8306R03	0.030/ 0.066
			1/ 3.28	VW3A8306R10	0.050/ 0.110
			3/ 9.84	VW3A8306R30	0.150/ 0.331
	1 x RJ45 connector and 1 end with flying leads	6	1/ 3.28	TWDXCAFJ010	0.060/ 0.132
			3/ 9.84	VW3A8306D30	0.150/ 0.331
			—	—	—
Controller to Magelis HMI cordsets	2 x RJ45 connectors	5	2.5/ 8.20	XBTZ9980	0.230/ 0.507
	Compatible with: ☐ Com Port 1 on XBTN200/N400/R400/RT500 (2) ☐ Com Port 1 on XBTRT511/HMISTO/STU/SCU ☐ Com Port 2 on XBTGT2●●0...7●●0 and HMIGTO	5	10/ 32.81	XBTZ9982	—
	1 x RJ45 connector and 1 x 25-way SUB-D connector Compatible with: ☐ Com Port 1 on XBTN410/N410 and XBTR410/R411	—	2.5/ 8.20	XBTZ938	0.210/ 0.463
	1 x RJ45 connector and 1 x 9-way SUB-D connector Compatible with: ☐ Com Port 1 on XBTGT2●●0...7●●0	—	2.5/ 8.20	XBTZ9008	—
	1 x RJ45 connector and stripped wires Compatible with: ☐ Com Port 1 on XBTRT511/HMISTO/STU/SCU ☐ Com Port 2 on XBTGT2●●0...7●●0 and HMIGTO	—	3/ 9.84	VW3A8306D30	0.150/ 0.331
Line end adaptor Sold in packs of 2	For RJ45 connector R = 120 Ω, C = 1 nF	—	—	VW3A8306RC	0.200/ 0.441

Cordsets for RS 232 serial link

Cordset for DTE terminal (printer) (3)	Serial link for Data Terminal Equipment (DTE) 1 x RJ45 connector and 1 x 9-way female SUB-D connector	3/ 9.84	TCSCMCN3M4F3C2	0.150/ 0.331
Cordset for DCE terminal (modem, converter)	Serial link for point to point device (DCE) 1 x RJ45 connector and 1 x 9-way male SUB-D connector	3/ 9.84	TCSCMCN3M4M3S2	0.150/ 0.331

(1) Line isolation recommended for line distances > 10 m/32.808 ft.

(2) Can only be connected to the controller SL or SL1 ports in order to supply the Magelis terminal with power.

(3) If the terminal is equipped with a 25-way SUB-D connector, you will also need to order the TSXCTC07 25-way female/9-way male SUB-D adaptor.

Modicon M221 logic controllers

Ethernet Modbus/TCP network

For Modicon M221, M241 and M251 logic controllers and TM4ES4 Ethernet switch module

Presentation

The embedded Ethernet communication ports in each Modicon M221, M241 and M251 logic controller and in the Modicon TM4ES4 communication module optimise integration in factory network architectures.

Modicon M221, M241 and M251 controllers can easily be integrated in typical architectures:

- **machine to devices** (variable speed drives, remote I/O modules, operator dialogue terminals) with the I/O Scanner function
- **machine to machine** with the NGVL function
- **machine to supervision** with the Modbus Client/Server function

Ethernet also brings transparency to the factory, in particular - thanks to the firewall functions - making it possible from any point on the network to safely:

- program, monitor a controller or download an application
- access device parameters (variable speed drives for example)

A simple web browser can be used to access machines anytime anywhere, using a tablet or smartphone, for example, using the web servers embedded in Modicon M241 and M251 controllers.

Safety can be enhanced by the use of VPN modems (see our partner programme).

The Modbus TCP/IP protocol

Modbus has been the industry communication standard since 1979. During the internet revolution, Modbus was combined with Ethernet Modbus/TCP to form Modbus/TCP, a completely open Ethernet protocol. The development of a connection to Modbus/TCP does not require any proprietary component, nor purchase of a licence.

This protocol can easily be combined with any product supporting a standard TCP/IP communication stack.

The specifications can be downloaded free of charge from the following address: www.modbus.org.

Modbus/TCP, simple and open

- The Modbus application layer is simple and universally familiar with its 9 million installed connections.
- Thousands of manufacturers have already implemented this protocol. Many have already developed a Modbus/TCP connection and numerous products are presently available.
- The simplicity of Modbus/TCP enables any fieldbus device, such as an I/O module, to communicate on Ethernet without the need for a powerful microprocessor or a lot of internal memory.

Modbus/TCP, high performance

Thanks to the simplicity of its protocol and the fast speed of 100 Mbps, the performance of Modbus/TCP is excellent. This type of network can therefore be used in realtime applications such as I/O digitisation.

Modbus/TCP, a standard

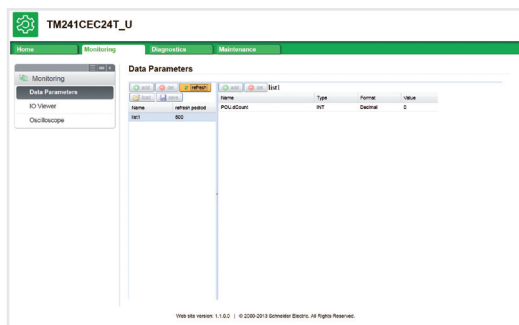
- The application protocol is identical on Modbus serial link and Modbus/TCP: messages can be routed from one network to the other without converting the protocol.
- Since Modbus operates on the TCP higher layer, users benefit from IP routing, thus enabling devices located anywhere in the world to communicate without worrying about the distance between them.

Modbus and Modbus/TCP are recognised as a fieldbus by the international standard IEC/EN 61158. They also comply with the "national Chinese standard" managed by ITEI.

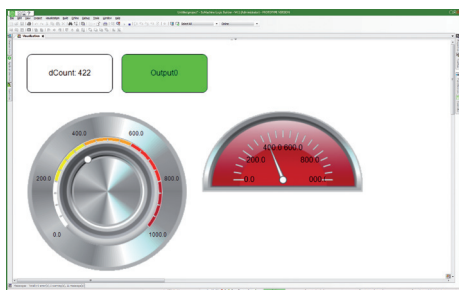
Modicon M221 logic controllers

Ethernet Modbus/TCP network

For Modicon M221, M241 and M251 logic controllers and TM4ES4 Ethernet switch module



Preconfigured Web server



Viewer Web server

Web servers

Preconfigured Web server

Using a simple Internet browser available on PC, smartphone or tablet, this server authorizes the following “ready-to-use” functions:

- With no prior programming
 - Display of the I/O states
 - Controller diagnostics, and of its expansion and communication modules
 - Communication port diagnostics
 - I/O Scanner function diagnostics
 - Maintenance and configuration functions (Ethernet IP, firewall, etc.)
- After configuration
 - Viewing data values
 - Viewing the evolution of those data values over time (oscilloscope function)

Viewer Web server

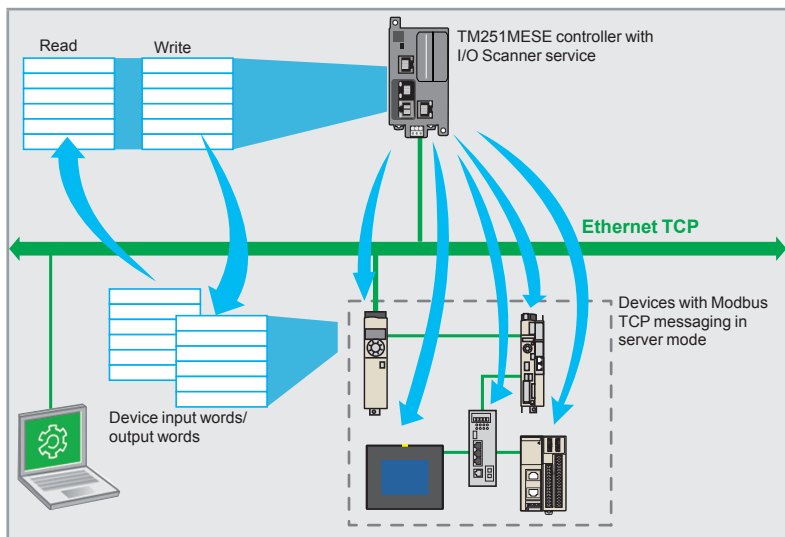
The SoMachine programming software is used to create customised pages for viewing and monitoring devices. These pages can also be accessed on any mobile device such as a tablet or smartphone with any operating system (iOS, Android, Windows).

Description of Ethernet services

Network Global Variable List (NGVL)

The NGVL protocol allows a controller to share data with other controllers on a local Ethernet network (LAN) or subscribe to data published by other controllers which support the NGVL protocol and thus allowing, for example, synchronisation between control platforms.

I/O Scanner



The Modbus TCP I/O Scanner service is used to manage the exchange of remote I/O states on the Ethernet network after a simple configuration operation, with no need for special programming.

I/O Scanner is performed transparently by means of read/write requests in accordance with the Modbus client/server protocol on the TCP profile. This principle of Scanner via a standard protocol enables a device with the I/O Scanner service to communicate with any device supporting Modbus TCP messaging in server mode (slave Modbus TCP). The M251MESE I/O Scanner system supports up to 64 devices (one Modbus request per device).

Modicon M221 logic controllers

Ethernet Modbus/TCP network

For Modicon M221, M241 and M251 logic controllers and TM4ES4 Ethernet switch module

Description of Ethernet services *(continued)*

Slave Modbus TCP

This function can be used to create a dedicated I/O table in the controller, which can be accessed via the Modbus TCP protocol and by a controller with the Modbus TCP I/O Scanner function.

Fast Device Replacement (FDR)

This service uses standard address management technologies (BOOTP, DHCP) and the TFTP (Trivial File Transfer Protocol) file management service, in order to simplify maintenance of Ethernet products.

The FDR service is used to replace a device with a new device; the faulty device is detected, reconfigured and automatically rebooted by the system.

Access to files via FTP (File Transfer Protocol)

This service provides access to the controller files from, for example, a PC (FTP client) and is used to exchange files such as application programs, data, etc.

This service can be accessed even if the controller has no application program in its memory.

Dynamic Host Configuration Protocol (DHCP)

This protocol can be used to assign an address to a controller (client DHCP/BOOTP) automatically. This address can be:

- ☐ Fixed and determined either in the SoMachine software or included in a post-configuration file
- ☐ Assigned by a controller with the DHCP server or BOOTP server function (such as the TM251MESE controller).

SNMP (Simple Network Management Protocol)

From a network management station, the SNMP protocol is used to monitor and control the Ethernet architecture components, meaning problems are diagnosed quickly.

The SNMP protocol is used to access configuration and management objects that are contained in the device MIBs (Management Information Bases).

Modicon M241 and M251 controllers support the "MIB 2 Standard" SNMP network management interface. This interface accesses a first level of network management; it enables the manager to identify the devices making up the architecture and retrieve general information about configuration and operation of the Ethernet Modbus/TCP interfaces.

IP address filter (Whitelisting)

IP addresses that are authorised to access the controller can be loaded in the controller from either an SD card or an FTP client.

Locking communication protocols

Not only SoMachine, NetManage (1), SNMP communication protocols but also Modbus, WEB and FTP servers can be locked individually in the SoMachine software.

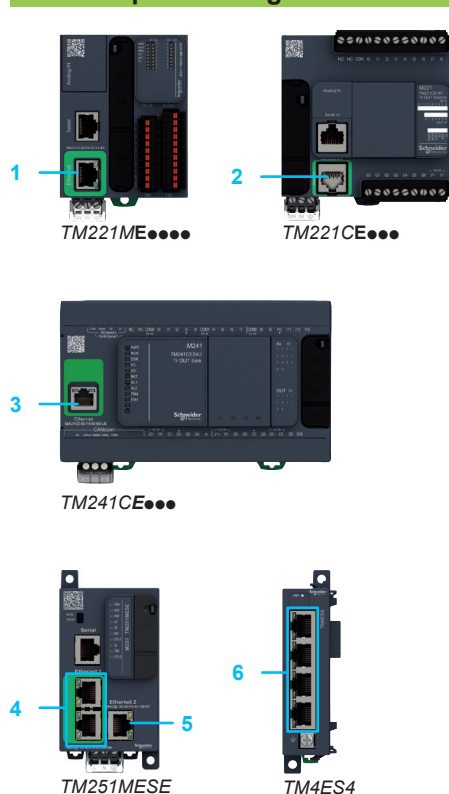
(1) The NetManage function can automatically detect which controllers are present on the network. It also offers the option of straightforward connection to any controller present on the network in order to identify it physically by means of a visual or audible message and modify its parameters or manage the resident application.

Transparent Ready class and Functions

	Logic controllers			
	TM221ME●●● TM221CE●●●	TM241CE●●● TM241C●●● + TM4ES4	TM251MESSC	TM251MESE
Transparent Ready class	A10	B20		
Internet protocol version	IP V4			
Ethernet services				
Programming, downloading, monitoring				
Firmware update	—			
Client and server Modbus TCP				
Slave Modbus TCP				
Ethernet IP (adapter)	—			
Data exchange: NVGL and IEC VAR ACCESS	—			
WEB server	—			
MIB2 SNMP network management	—			
Modbus TCP I/O Scanner	—	—	—	
FTP file transfer	—			
Client DHCP dynamic configuration				
Server DHCP dynamic configuration	—	—	—	
FDR faulty device replacement	—	—	—	
SMS, emails	Availabilityy : 4 th quarter 2014	—	—	—
Safety functions				
IP address filter (Whitelisting)	—			
Locking communication protocols				
Locking IP address routing	—	—	—	

function created

Ethernet ports on logic controllers and the communication module



M221 logic controllers

- 1 On **TM221ME●●●** controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.
- 2 On **TM221CE●●●** controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.

M241 logic controllers

- 3 On **TM241CE●●●** controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.

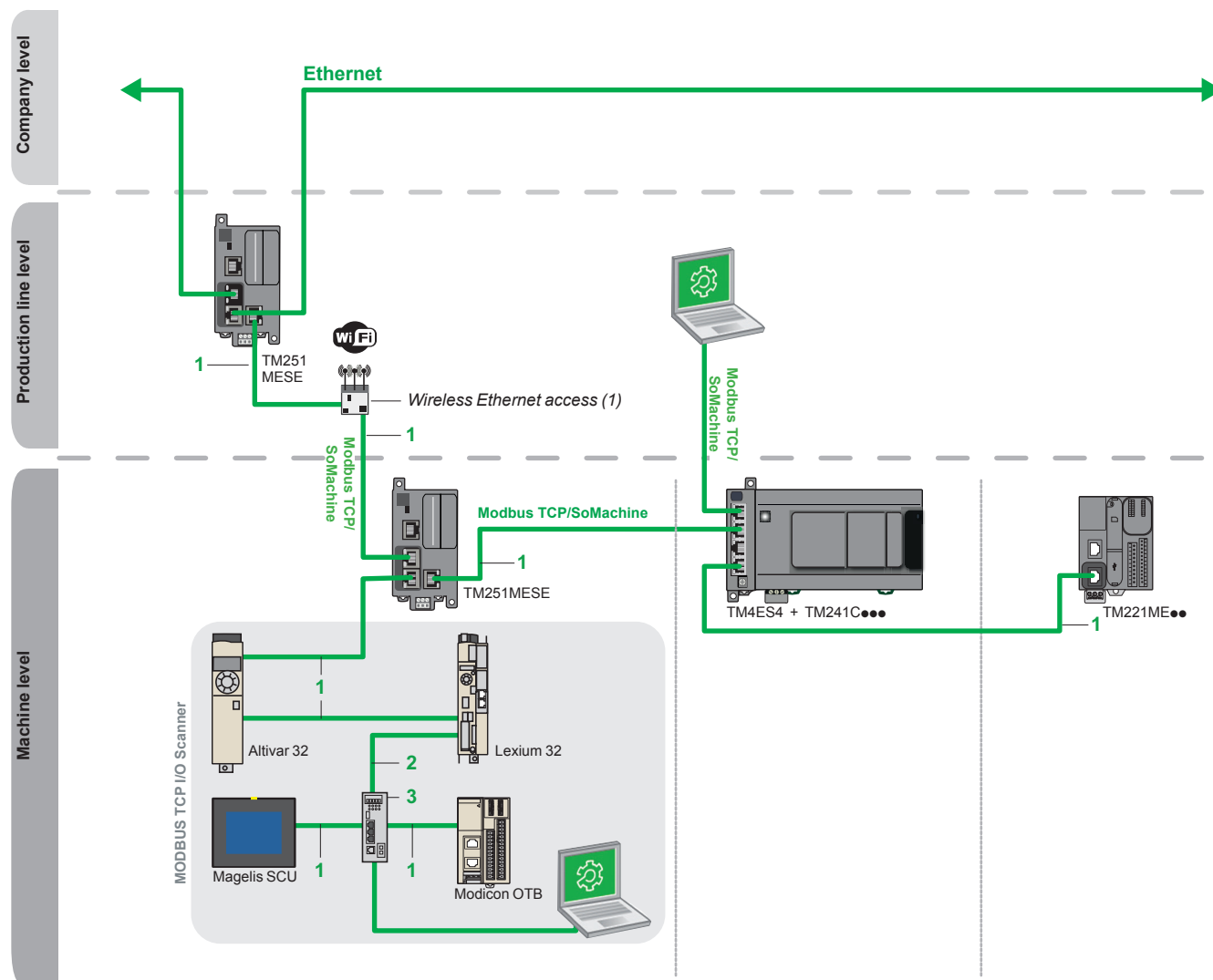
M251 logic controllers

- 4 On **TM251MESE** and **TM251MESSC** controllers: 2 connectors connected by an RJ 45 internal switch for "Machine or Factory" Ethernet network, with exchange rate and activity LED.
- 5 On **TM251MESE** controller: RJ 45 connector for "fieldbus" Ethernet 2 network, with exchange rate and activity LED. The Ethernet 2 network can be used with the Modbus TCP I/O Scanner function.

TM4ES4 Ethernet switch communication module

- 6 4 RJ 45 connectors for Ethernet 2 network, with exchange rate and activity LED.

Communication architecture on Ethernet network



NB: The ports on M251 controllers and the TM4ES4 communication module cannot be used to create redundant architectures.

(1) Wireless Ethernet access, see our partner programme.

Items 1, 2 and 3: see references on next page.

Shielded copper connection cables

ConneXium shielded connection cables are available in two versions to meet the requirements of the various current standards and approvals:

■ EIA/TIA 568 shielded twisted pair cables for CÉ market

These cables conform to:

- ☐ EIA/TIA-568 standard, category CAT 5E
- ☐ IEC 11801/EN 50173-1 standard, class D

Their fire resistance conforms to:

- ☐ NF C32-070 standard, class C2
- ☐ IEC 322/1 standards
- ☐ Low Smoke Zero Halogen (LSZH)

■ EIA/TIA 568 shielded twisted pair cables for UL market

These cables are:

- ☐ CEC type FT-1
- ☐ NEC type CM

A new range of **ConneXium** fully shielded preassembled cables has been specially designed for use in harsh industrial environments. These cables combine a category 5E shielded cable and RJ 45 connectors reinforced with a metal profile.

Modicon M221 logic controllers

Ethernet Modbus/TCP network

For Modicon M221, M241 and M251 logic controllers and TM4ES4 Ethernet switch module

References

EIA/TIA 568 shielded twisted pair cables for C€ market

Description	End fittings	Item	Type	Length m/ft.	Reference	Weight kg/lb
Straight-through copper cables C€ compatible	2 RJ 45 connectors For connection to terminal devices (DTE)	1	standard	2/6.56	490NTW00002	—
				5/16.40	490NTW00005	—
				12/39.37	490NTW00012	—
				40/131.23	490NTW00040	—
				80/262.47	490NTW00080	—
		1	ruggedised	1/3.28	TCSECE3M3M1S4	—
				2/6.56	TCSECE3M3M2S4	—
				3/9.84	TCSECE3M3M3S4	—
				5/16.40	TCSECE3M3M5S4	—
				10/32.81	TCSECE3M3M10S4	—



TCSEC3M3M1S4

Shielded twisted pair cables for UL market

Description	End fittings	Item	Type	Length m/ft.	Reference	Weight kg/lb
Straight-through copper cables UL compatible	2 RJ 45 connectors For connection to terminal devices (DTE)	1	standard	2/6.56	490NTW00002U	—
				5/16.40	490NTW00005U	—
				12/39.37	490NTW00012U	—
				40/131.23	490NTW00040U	—
				80/262.47	490NTW00080U	—
		1	ruggedised	1/3.28	TCSECU3M3M1S4	—
				2/6.56	TCSECU3M3M2S4	—
				3/9.84	TCSECU3M3M3S4	—
				5/16.40	TCSECU3M3M5S4	—
				10/32.81	TCSECU3M3M10S4	—

Do it Yourself copper cable and connectors

The **ConneXium** "Do it Yourself" offer consists of 2 connector references (M12 and RJ 45) and 1 cable reference - 300 m/984.252 ft. reel - enabling Ethernet 10/100 Mbps network cables to be made up in situ. The maximum length of cables made up in this way is 80 m/262.467 ft. They are assembled using only a knife and wire cutters (no special tool is required).

Description	Characteristics	Item	Length m/ft.	Reference	Weight kg/lb
Ethernet copper cable 2 shielded twisted pairs 24 AWG	Conforms to the standards and approval listed above	2	300/984.25	TCSECN300R2	—
RJ 45 connector	Conforms to EIA/TIA-568-D	2	—	TCSEK3MDS	—



TCSESU053FN0

ConneXium unmanaged switches, 3, 4 and 5 ports, twisted pair and optical fibre

Description	Interfaces	Item	Reference	Weight kg/lb
ConneXium unmanaged switches	3 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors	3	TCSESU033FN0	0.113/0.249
	■ 4 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors	3	TCSESU043F1N0	0.120/0.265
	■ 1 x 100BASE-FX port (multimode optical fibre), duplex SC connector			
	5 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors	3	TCSESU053FN0	0.113/0.249

Other wiring components are available, please consult the **ConneXium** offer on our website www.schneider-electric.com.

Compatibility					
Modicon TM2 expansion modules		Logic controllers			
		M221	M221 Book	M241	M251
Digital modules	TM2DDI8DT				
	TM2DDI16DT				
	TM2DDI16DK				
	TM2DDI32DK				
	TM2DAI8DT				
	TM2DDO8UT				
	TM2DDO8TT				
	TM2DDO16UK				
	TM2DDO16TK				
	TM2DDO32UK				
	TM2DDO32TK				
	TM2DRA8RT				
	TM2DRA16RT				
	TM2DMM8DRT				
	TM2DMM24DRF				
Analog modules	TM2AMI2HT				
	TM2AMI2LT				
	TM2AMI4LT				
	TM2AMI8HT				
	TM2ARI8LRJ				
	TM2ARI8LT				
	TM2ARI8HT				
	TM2AMO1HT				
	TM2AVO2HT				
	TM2AMM3HT				
	TM2ALM3LT				
	TM2AMM6HT				
Expert modules (counter modules)	TM200HSC206DT				
	TM200HSC206DF				

Compatible

Not compatible

Note: The expansion and communication module range **TWD●●●●●** is not compatible with Modicon M221, M241, M251 logic controller offer.

Configuration

Modicon TM2 digital I/O modules connect to Modicon M221, M221 Book, M241 and M251 logic controllers according to the general rules for the Modicon TM3 system: a maximum of 7 local I/O modules (1); this can be increased to 14 modules (1) using Modicon TM3 bus expansion modules (transmitter and receiver): local I/O + remote I/O.

- The maximum number of Modicon TM2 expansion modules can be reduced by the number of transistor outputs or relay outputs used (see the table below).
- If more transistor or relay outputs are required than the maximum number given in the table, use Modicon TM3 bus expansion modules (transmitter and receiver). In this case, 7 Modicon TM2 modules can be connected to the right of the **TM3XREC1** receiver module without limiting the number of outputs.

Configuration limits	Logic controllers									
	TM221									
	C16R CE16R	C16T CE16T	C24R CE24R	C24T CE24T	C40R CE40R	C40T CE40T	M16R ME16R M16RG ME16RG	M16T ME16T M16TG ME16TG	M32TK ME32TK	TM241/ TM251 TM241●●●●● TM251●●●●●
Maximum number of Modicon TM2 module (local) transistor outputs directly connected to the controller (2)	54	67	71	89	113	143	216	(3)		
Maximum number of Modicon TM2 module (local) relay outputs directly connected to the controller (2)	23	29	30	38	48	61	92	98	97	(3)

(1) Excluding TM2●●●24●● and TM2●●●32●● modules: a maximum of 3 local I/O modules and 6 modules in total using TM3 bus expansion modules.

(2) If using bus expansion modules: maximum number of Modicon TM2 module relay or transistor outputs installed between the controller and the TM3XTRA1 transmitter module (local outputs).

(3) Up to 7 Modicon TM2 modules regardless of the number of outputs used.

490NTW00002	27	TM221M16TG	17
490NTW00002U	27	TM221M32TK	17
490NTW00005	27	TM221ME16R	17
490NTW00005U	27	TM221ME16RG	17
490NTW00012	27	TM221ME16T	17
490NTW00012U	27	TM221ME16TG	17
490NTW00040	27	TM221ME32TK	17
490NTW00040U	27	TMACBL1	18
490NTW00080	27	TMAM2	18
490NTW00080U	27	TMASD1	18
A		TMAT2CSET	18
ABE7E16EPN20	19	TMAT2MSET	18
ABE7E16SPN20	19	TMAT2MSETG	18
ABE7E16SPN22	19	TMAT2PSET	18
ABE7E16SRM20	19	TMC2AI2	16
ABFT20E050	19	TMC2AQ2C	16
ABFT20E100	19	TMC2AQ2V	16
ABFT20E200	19	TMC2CONV01	16
B		TMC2HOIS01	16
BMXXCAUSBH018	18	TMC2PACK01	16
L		TMC2SL1	16
LU9GC3	21	TMC2TI2	16
T		TMH2GDB	18
TCSECE3M3M1S4	27	TSXCSA100	21
TCSECE3M3M2S4	27	TSXCSA200	21
TCSECE3M3M3S4	27	TSXCSA500	21
TCSECE3M3M5S4	27	TSXCSA50	21
TCSECE3M3M10S4	27	TWDFCW30K	19
TCSECN300R2	27	TWDFCW50K	19
TCSECU3M3M1S4	27	TWDXCAJ010	21
TCSECU3M3M2S4	27	TWDXCAISO	21
TCSECU3M3M3S4	27	TWDXCAT3RJ	21
TCSECU3M3M5S4	27	V	
TCSECU3M3M10S4	27	VW3A8306D30	21
TCSEK3MDS	27	VW3A8306D30	21
TCSESU033FN0	27	VW3A8306R03	21
TCSESU043F1N0	27	VW3A8306R10	21
TCSESU053FN0	27	VW3A8306R30	21
TCSMCN3M4F3C2	21	VW3A8306RC	21
TCSMCN3M4M3S2	21	VW3A8306TF03	21
TCSXCNAMUM3P	18	VW3A8306TF10	21
TM221C16R	16	X	
TM221C16T	16	XBTZ938	21
TM221C24R	16	XBTZ9008	21
TM221C24T	16	XBTZ9980	21
TM221C40R	16	XBTZ9982	21
TM221C40T	16	XGSZ24	21
TM221CE16R	16		
TM221CE16T	16		
TM221CE24R	16		
TM221CE24T	16		
TM221CE40R	16		
TM221CE40T	16		
TM221M16R	17		
TM221M16RG	17		
TM221M16T	17		

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DIA3ED2140106EN